	Ben Nevis, June—Aug. 1884	Säntis, June—Aug. 1884	Mr. Washington, May—June, 1873	Ben Nevis, Dec.—Feb. 1883—84
1 a.m.	15	18	20	9
2 ,,	15	24	15	7
3 ,,	19	24	9	8
4 ,,	12	16	8	7
5 ,,	7	12	8	3
6 ,,	8	8	1	5
7 ,,	0	4	− 2	3
8 ,,	− 2	− 7	0	1
9 ,,	− 3	− 13	− 8	− 3
10 ,,	− 5	− 15	− 10	− 6
11 ,,	− 11	− 20	− 12	− 8
noon	15	− 18	− 19	− 7
1 p.m.	− 11	− 19	− 16	− 7
2 ,,	− 15	− 17	− 12	− 7
3 ,,	− 14	− 11	− 15	− 7
4 ,,	− 10	− 11	− 13	− 7
5 ,,	− 10	− 9	− 7	− 3
6 ,,	− 5	− 8	− 4	− 4
7 ,,	− 3	7	− 1	5
8 ,,	− 0	10	− 3	3
9 ,,	0	5	5	4
10 ,,	9	2	15	8
11 ,,	11	7	19	8
midnight	9	9	19	6

Hence the maximum occurs on these heights shortly after midnight, and the minimum shortly after noon. Now it will be seen that these diurnal maxima and minima occur nearer midnight and noon than do the phases of the other meteorological phenomena, thus suggesting a direct connection with solar and terrestrial radiation. It is singular that, while the diurnal period of strongest insolation determines the occurrence of the maximum velocity of the wind over extensive land surfaces, it determines the minimum velocity on peaks rising to a great height above the land surfaces surrounding them. Of special importance in its bearings on the question is the curve of diurnal variation on Ben Nevis for the three winter months of 1883-84, when the mean velocity of the wind was nearly double that of the summer months. In that season Ben Nevis was under a deep covering of snow, the sky clouded nearly the whole time, the air frequently darkened with dense drifting fogs, and the difference between the mean lowest and highest hourly temperature only half a degree. Notwithstanding the practical uniformity of temperature of the surface of the top of Ben Nevis during the twenty-four hours of the day, the curve of the diurnal variation in the wind's velocity was as clearly marked in winter as in summer, and the two curves were alike in showing the occurrence of the maximum shortly after midnight, and the minimum shortly after noon. We must therefore conclude that the peculiar type of the diurnal curves of wind velocity on these elevated peaks is altogether independent of the temperature of the surfaces over which the winds blow. The results point not obscurely to an investigation of the relations of the visible and invisible vapour of the atmosphere to solar and terrestrial radiation as an inquiry of first importance in meteorology.

OUR BOOK SHELF

Exercises in Electrical and Magnetic Measurement. By R. E. Day, M.A. New Edition. (London: Longmans, Green, and Co., 1884.)

MR. DAY has produced a new and considerably improved edition of a most useful and valuable little book. Every teacher of electricity whose work is not confined to the beggarly elements of mere phenomena will thank Mr. Day for the admirable selection of problems put together in this volume. Nothing could be a greater boon to the real student than the means thus afforded of testing his knowledge of the exact quantitative laws of the science. If it were not for the historic interest of that rather antiquated instrument the torsion balance—we should doubt the utility of giving so much attention to it. Although the more modern electrometers have entirely superseded the torsion balance as an instrument of research and of measurement, it has, nevertheless, become so prominently fixed—like some grand old fossil long ago extinct—amongst the characteristic forms of electrical instruments, that examiners still expect candidates for examination to know something about it. On the other hand, the space allotted to moments of torsion and inertia is all too brief, though admirably filled. We must, however, take exception to the practice apparently followed on p. 62, of expressing a moment of couple in *dynes*: it should surely be *dyne-centimetres*. The section on the chemical (or rather thermo-chemical) theory of electromotive force is excellent. The problems comprised under the heading Electromagnetic Measurement are admirable, though perhaps a little beyond most students.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Earthquakes and Terrestrial Magnetism

MR. W. H. PREECE having written to the Astronomer Royal to ask whether any disturbance of our magnets or our earth-current apparatus was experienced during the recent earthquake in Spain, it may be interesting to communicate also for the information of your readers the result of an examination of our photographic registers in consequence made, and especially in order that what has been remarked may, if possible, receive confirmation.

As respects magnetic movement, the magnets on Dec. 25 last and following days were generally quiet. But on looking more closely at the registers, attention was at once drawn to a small simultaneous disturbance of the declination and horizontal force magnets, occurring at 9h. 15m. on the evening of December 25. Both magnets were at this time set into slight vibration, the extent of vibration in the case of declination being about 2′ of arc, and in horizontal force equivalent to ·001 of the whole horizontal force nearly. The movements have not the character of magnetic movements, and, if in reality produced by the earthquake, are of course simply an effect of the shock, the magnets being heavy bars suspended by silk threads some feet in length. About ten minutes afterwards there is doubtful indication in the horizontal force register of a second disturbance. There is no corresponding perceptible disturbance in the earth-current registers.

No other similar motion is observable either on December 25 or on the following days.

It may be remarked that in NATURE for January 1 last (p. 200) the time of occurrence of the earthquake at Madrid is said to be 8h. 53m. p.m. Taking this to be Madrid time, it corresponds to 9h. 8m. of Greenwich time. WILLIAM ELLIS

Royal Observatory, Greenwich, January 15

Teaching Chemistry

THE subject of science-teaching in schools, and more particularly the best way in which practical chemistry should be taught, has of late been discussed in the columns of NATURE. With the editor's leave, I should like to say a little regarding the methods of teaching chemical science in general.

NATURE for January 8 contained notes, by Profs. Sir H. E.

Roscoe and W. J. Russell, on "Experiments suitable for Illustrating Elementary Instruction in Chemistry." These notes appear to me to be very useful as a rough guide to the school-teacher. But unless the teacher is able to arrange the experimental illustrations so that some conclusions regarding the elementary principles of chemistry shall be drawn from the results he obtains, which conclusions shall then be submitted to experimental examination, I think the notes will fail of their object.

It is to the want of progressiveness in the ordinary chemical course that I wish to draw attention.

The student of physics advances; he feels his way from one set of phenomena to another; he generalises, and gets hold of some principles on which he may rest. In the ordinary chemical course the student begins with enthusiasm; he is delighted with the experiments, and he takes a lively interest in the manipulative failures of the lecturer. But, after a little, the student finds that he is not progressing. When he has been told, and shown, the properties of hydrogen, oxygen, and water, he is expected to take as much interest as ever in hearing a list of properties of nitrogen and oxides of nitrogen. Then he fills his note-book with many facts regarding ammonia and nitric acid, and so on.

Now I do firmly believe that chemistry is a branch of science, and that it may be taught as such. I think it is possible, in a course of lectures on chemistry, to lead the fairly intelligent and not very idle student from simple facts about everyday occurrences to the difficult and apparently remote discussions regarding the architecture of molecules, in which chemists so much delight.

If lectures on chemistry were arranged so that principles should be discussed and amply illustrated by well-chosen experiments, instead of being (as I am afraid is still too often the case) repetitions of disconnected facts about a string of elements and compounds, I believe this branch of science would rapidly develop in this country. It seems to me that the distinction implied in the commonly-used terms *chemistry* and *chemical philosophy* is radically unsound. There are not two chemistrys, but one chemistry. We do not speak of physics as different from natural philosophy.

What we want is to convince our students that they are dealing with realities. I am continually presented with answers to questions, which perhaps demand a knowledge of the laws of chemical combination, wherein a few elementary facts are elevated to the rank of an all-embracing theory, and complex structural formulæ are dealt with in a style of appalling familiarity, as if they were the topics which it is necessary to discuss on the very threshold of chemistry. One is told that chlorine is a monad, that is, it is a "one-armed one"; and then the conclusion is triumphantly announced, "*thus we see why it is*" that hydrogen and chlorine combine to form hydrochloric acid, and so on. The other day I implored a candidate in a certain examination to give me a reason for writing the formula of alcohol C_2H_5—OH rather than C_2H_6O; he told me he had seen the former in a book. This is enough for the average student; and yet these people call themselves students of science. I am afraid the teachers are greatly to blame.

The examiners have undoubtedly much power; but I think the examinations in chemistry are improving as a whole.

When a lecturer in chemistry announces two series of lectures, one elementary and one advanced, is it not very often found that the advanced class is condemned to hear copious details regarding the purification and methods of separation of the rare metals, while the elementary class is entertained with an exhibition of the properties and reactions of the simple and compound gases? But is this chemistry?

I think that the teachers of chemistry must consent to abandon the time-honoured practice of placidly proceeding from element to element, and from compound to compound; they must ask themselves whether they know of any reasons why chemistry should be called a branch of natural science, and, having conscientiously answered this question, they must try to make their students really acquainted with these reasons.

Dr. Sydney Young (NATURE, vol. xxxi., p. 126) has referred to the paucity of good elementary text-books of chemistry. I, too, have felt the want of a really good book in attempting to teach the principles of chemistry to beginners. Is there any elementary book which treats chemistry as a genuine living science?

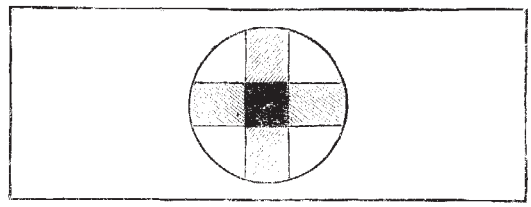
M. M. PATTISON MUIR

Cambridge, January 12

A Method of Isolating Blue Rays for Optical Work

IN many optical experiments, *e.g.* in examining the dispersion of optic axes in crystals, a homogeneous or monochromatic light is required. A fairly homogeneous red light, nearly corresponding to the Fraunhofer line B, can be obtained by a properly-selected piece of red glass placed in front of a good Argand burner or paraffin lamp. For yellow light, nothing can be better than the flame of a Bunsen's burner in which a bead of sodium carbonate is held in a loop of platinum wire. For blue rays, the light transmitted by a solution of cuprammonium sulphate is generally recommended, since the ordinary blue glass coloured with cobalt invariably transmits red rays as well as blue. But the use of a glass cell containing a strong ammoniacal solution is often inconvenient and unpleasant.

I have met with a peculiar kind of greenish-blue glass, used for railway signal lamps, and known as "signal-green glass" (coloured, I believe, with copper in its divalent condition), which is remarkably opaque to the less refrangible rays nearly as far as Fraunhofer's line E, while it transmits a large quantity of blue and some green light. By combining a piece of this glass with a piece of rather deep-tinted cobalt glass, the red rays transmitted by the latter may be wholly stopped, and only the part of the



spectrum between F and G is transmitted, constituting a light at any rate not less homogeneous than that transmitted by solution of cuprammonium sulphate.

This "signal-green glass" is also useful in illustrating selective absorption of light by different media. If, for instance, a piece of it is superposed on a piece of properly-selected red glass, each absorbs what the other transmits, and practically no luminous rays survive the two; only a faint neutral-tinted light struggling through, even when strong sunlight is used.

This can be well shown on the screen by fixing a narrow strip of the "signal-green glass" vertically in a lantern-slide, and crossing it with a similar strip of red glass fixed horizontally in the same frame. The square space where the two overlap appears absolutely black.

The same arrangement is useful for other absorption-experiments, since the original colours of the media are shown, as well as the result of their superposition.

It is necessary to remember that much lighter tints are wanted for lantern-work than for subjective experiments.

Eton College, January 10 H. G. MADAN

Barrenness of the Pampas

IN the admirable address of Prof. Asa Gray at Montreal, he alludes to the singular absence of trees and herbaceous plants throughout the Pampas or vast level plains of the South American continent, and he indorses the opinion of Mr. Darwin and Mr. Ball that this absence is due to the fact that the only country from which they could have been derived could not supply species adapted to the soil and climate. As this is a subject to which I paid considerable attention during a long residence in South America, I venture to call attention to the explanation of this phenomenon, which my observations gave rise to as described in my "Visit to South America," 1878.

The peculiar characteristics of these vast level plains which descend from the Andes to the great river basin in unbroken monotony, are the absence of rivers or water-storage, and the periodical occurrence of droughts, or "siccos," in the summer months. These conditions determine the singular character both of its flora and fauna.

The soil is naturally fertile and favourable for the growth of trees, and they grow luxuriantly wherever they are protected. The Eucalyptus is covering large tracts wherever it is inclosed, and willows, poplars, and the fig, surround every estancia when fenced in.

The open plains are covered with droves of horses and cattle, and overrun by numberless wild rodents, the original tenants of